

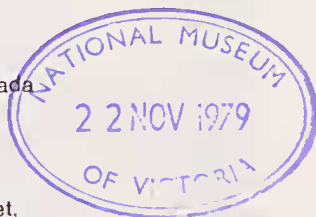
SOME AQUATIC OLIGOCHAETA FROM TASMANIA

by

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ABSTRACT

Ten new species of aquatic oligochaetes are described from Tasmania. The species are all in the families Tubificidae (four species), or Phreodrilidae (six species). Nine other species already described are shown to be present in the State thus bringing to nineteen the total number of oligochaete species positively identified from Tasmania.

INTRODUCTION

The aquatic oligochaete fauna of Tasmania was unknown prior to the discovery of the three tubificids *Telmatodrilus multiprostatus*, *T. pectinatus* and *Antipodrilus davidis* and the cosmopolitan *Lumbriculus variegatus* by Brinkhurst (1971). More recently Timms (1978) has established the presence of five other species (*Phreodrilus branchiatus*, *P. maiienensis*, *Tubifex tubifex*, *Limnodrilus hoffmeisteri* and *L. udekemianus*). Material now available from the South Esk River, Great Lake, and some other lakes, collected by the junior author, Mr. R. H. Norris and Dr. B. V. Timms, has confirmed the presence of two of these and uncovered ten species new to science, giving a total of nineteen known Tasmanian forms. This new material has made possible the identification of some of the forms previously recorded from Tasmania but not described for lack of adequate material (Brinkhurst, 1971, p. 110), but several species remain to be described.

The descriptions are brief but are adequate for the identification of the species concerned. In some instances, there was enough material to permit serial sections to be made as noted in the text, sometimes there was not. More detailed studies should be made but are beyond the scope of this initial report.

All specimens used in the study were collected by the junior author (unless otherwise stated in the text) from Great Lake, Tasmania, at various dates throughout 1975. Type material of the new species as well as specimens of some of the other species discussed has been deposited in the Queen Victoria Museum, Launceston (QVM). This abbreviation appears in the text with the type or deposit number for the material.

Family TUBIFICIDAE

Genus *Limnodrilus* Claparede, 1862

Limnodrilus hoffmeisteri Claparede, 1862

This cosmopolitan species was found in small numbers in Brandum Bay, Great Lake. It was first recorded, along with *L. udekemianus*, by Timms (1978) who also reported the cosmopolitan *Tubifex tubifex*.

Genus *Antipodrilus* Brinkhurst, 1971*Antipodrilus plectilus* sp. nov.

Figures 1-5

Description: Small thin red worms up to 40 mm extended. Dorsal and ventral anterior bundles of setae with 7 to 8 or 9 setae, reducing in number to 3 per bundle and eventually to only 4 per segment posteriorly. Setae of II with upper tooth shorter and thinner than the lower, setae of other pre-clitellar bundles with teeth equally long, upper slightly thinner if not equal in width; posteriorly upper teeth shorter and thinner. Spermathecal setae single, thin, hollow-tipped, lying in glandular sacs. Atria elongate; distended where vasa deferentia and prostate glands are attached; ejaculatory ducts moderately long, penes simple without cuticular sheaths. Spermatzeugmata elongate, one end thin. Other characteristics as for the family.

Material: Collected from Swan Bay, Cramps Bay and Brandum Bay in Great Lake. Seven specimens examined, four mature.

Holotype, 1977/14/6 — QVM type 242.

Paratypes, 1977/14/1-5, 7 — QVM types 258-263.

Discussion: *A. plectilus* is found in clusters of up to about fifty specimens where abundant, most often in fine silts with more than 50% by weight below 4.0 ϕ units.

The distinction between this and other species in the genus will be discussed below.

Antipodrilus multiseta sp. nov.

Figures 6-8

Description: Large worms, up to 50 mm long. Red-pink in colour, covered by a sheath of small sand grains. Anterior end tapering to coiled tail. Dorsal and ventral anterior bundles of II with 12-15 setae, gradually diminishing in number to 3-4 posteriorly. Anterior setae bifid with blunt teeth of equal thickness, the upper slightly longer. Posterior setae with upper teeth shorter than the lower. Spermathecal setae single, thin, hollow-tipped, apparently in glandular sacs. Atria small, vasa deferentia moderately long, ejaculatory ducts long and thin, prostate glands small, penes simple, no cuticular sheaths. Spermathecae voluminous, spermatzeugmata elongate. Other characteristics as for the family.

Material: Collected from Cramps Bay and Brandum Bay in Great Lake. Five specimens examined.

Holotype, 1977/14/8 — QVM type 243.

Paratypes, 1977/14/9-10, 110 — QVM types 264-265, 354.

Discussion: The type species *A. davidis* (Benham) and the only other species *A. timmsi* Br., have hair-setae which are lacking in both new species. Otherwise the new species share many of the characteristics of the genus, but differ from each other in the number and form of the setae and the length of the ejaculatory ducts.

The genus is limited to Australia and New Zealand.

Genus *Telmatodrilus* Eisen, 1879*Telmatodrilus (Alexandrovina) papillatus* sp. nov.

Figures 9-14

Description: Worms encrusted with foreign particles. Pharynx eversible. Body wall papillate, large papillae in rings halfway between successive seta bundles, rings of smaller papillae halfway between each seta series and the ring of larger papillae. Anterior setae bifid, 5-7 per bundle with each tooth broad, shovel-shaped, gradually becoming hair-like until post-clitellar segments with 5-9 hair setae in dorsal and ventral bundles. Penial setae 3-4 per bundle, with bifid tips. Male pore median, two short atria enter median chamber close together. At least 2 or 3 prostate glands on atria apically. Prominent tubercle on IX.

Material: Collected from Brandum Bay in Great Lake and also from Lake Sorell (B. V. Timms). Seven specimens examined, one mature.

Holotype, 1977/14/11-12 — QVM types 244-245.

Paratypes, 1977/14/94-99 — QVM types 338-343.

Discussion: The genus *Telmatodrilus* originally consisted of the two poorly described Californian species, *T. vej dovskiy* and *T. mcgregori*. Fresh specimens were obtained by the senior author in 1966 and were identified as *T. vej dovskiy*, the second species having early been regarded as a synonym of this species (Brinkhurst, 1965). Two multi-prostate species were described from Lake Pedder, Tasmania, as *T. pectinatus* and *T. multiprostatatus* by Brinkhurst (1971). The former has since been recorded from Lake Tali Karng, Victoria, Australia (Timms, 1974) and the latter has been identified by the senior author from material collected in the South Esk River, Lake Sorell and Lake Crescent in Tasmania. *Telmatodrilus pectinatus* was thought to be the only tubificid having the pectinate setae limited to posterior segments rather than the anterior dorsal segments, but Holmquist (1974) recognised an oversight in the earlier descriptions of the Californian species, which also proves to have pectinate (or rather brush-tipped) posterior setae. That author, however, recognised the rediscovered Californian material as *T. mcgregori* rather than *T. vej dovskiy*, and considered the Tasmanian species to be excluded from *Telmatodrilus* but did not assign them to a taxon other than the (monogeneric) subfamily *Telmatodrilinae*. She also preferred to see the other multiprostate species *T. onegensis* and *T. ringulatus* remain in the genus *Alexandrovina*, proposed by Hrabě (1962) for the former, which he found in Onega Lake (located between the Gulf of Finland and the White Sea in European Russia). Holmquist expanded the description of this genotype from Alaskan material. These two species are papillate, as is the new species found in Tasmania, and hence this new form is assigned to *Alexandrovina*, but that taxon is regarded as a subgenus pending clarification of the various points of difference between it and *Telmatodrilus*. Spermatozuogmata have been recorded in both *Alexandrovina* species, but the newly described specimen seems to lack spermathecae. There are no spermatozuogmata in *T. vej dovskiy* (as *mcgregori* acc. Holmquist).

The latest member of the assemblage *T. papillatus* is instantly recognisable by its extraordinary setae, in which bifid setae with shovel-like teeth become transformed into hair-like setae in all bundles. This characteristic alone might be regarded by some as sufficient grounds for the erection of a new genus, but the senior author prefers the conservative position of retaining one generic name for all these multi-prostate species in order to signal this unique similarity, at least until they are all subject to more detailed examination.

Telmatodrilus (Telmatodrilus) multiprostatatus Brinkhurst 1971

Two mature specimens from the South Esk River (R. H. Norris coll.). Also Lake Sorell and Lake Crescent (B. V. Timms).

1977/14/100-101.

Telmatodrilus? (Telmatodrilus?) bifidus sp. nov.

Figures 15-19

Small pink worms, up to 25 mm long, generally uniform in thickness but narrowing posteriorly. Setae bifid, anteriorly up to 13 per bundle with upper tooth longer than but thinner than the broad lower. Posteriorly setae progressively fewer in number, upper tooth thinner and shorter than lower from VIII or X, setae strongly sigmoid posteriorly. Some of the setae appear to be ornamented (figure 15). Spermathecal setae single straight, thin, hollow-tipped, varying in length from shorter than to three times longer than the normal ventrals. Penial setae bifid, straight, twice as long and thick as ventral setae, 6-7 per bundle. Spermathecae small, bilobed with short duct-like extension; pores lateral. Spermatozuogmata short. Atria small, spherical bodies on short, straight stems; vasa deferentia short. No cuticular penis sheaths. Prostate glands bilobed, extending around the vasa deferentia anteriorly but with a posterior lobe, precise attachment to atria not discerned. Male pores and penial setae open into large median depression.

Material : Collected from a depth of about 15 m in Swan Bay, Brandum Bay and Cramps Bay in Great Lake. Five mature specimens dissected, two sectioned, three immature sectioned.

Holotype, 1977/14/13 — QVM type 246.

Paratypes, 1977/14/14-24 — QVM types 266-276.

Discussion : This species is assigned to *Telmatodrilus* with some degree of uncertainty, which will only be clarified by examining the precise association between the prostate glands and atria. The prostates are at least bilobed, but whether they connect to the atria by one broad connection or two or more connections, cannot be discerned from dissections or sections of the first series of specimens.

The relatively large number of setae, presence of both modified spermathecal and moderately modified penial setae, presence of an eversible pseudopenis and absence of coelomocytes together with the short, rounded atrial form agree quite closely with another Tasmanian species, *Telmatodrilus pectinatus*, described from Lake Pedder (Brinkhurst, 1971). The prostates were quite clearly seen in that species, and the setae were assigned to their appropriate locations. Holmquist (1974) found the specimens to be in a poor condition, and the same is true of those still in the senior author's possession. For some reason, the mounting medium beneath the sealed-on cover glass has disappeared, forming large bubbles. The gut of those specimens was full of large coarse sand grains, so much so that the preparations are unusually thick, and sections could not be prepared without obtaining live material and starving them which was not feasible. Holmquist pointed out that the number of prostates, their position on the atria, and the form of atria in the Tasmanian species are quite different to those found in *T. vej dovskyi/mcgregori*, as is the lack of a true penis. She proposed to exclude them from both *Telmatodrilus* and *Alexandrovina* to retain them in the subfamily, but declined to erect a new genus until more adequate material is available. Her proposals are supported by the similarities between members of this assemblage including the primary character, numerous prostates, and some other minor points, such as a rather large number of setae. There are differences, just as there are within the monogeneric family *Phreodrilidae* (genus *Phreodrilus*) as described below, but it would seem more convenient, given our state of knowledge, to emphasise the similarity rather than the differences until more is known. The only decision to make is the level at which the similarity is recognised.

However, this latest form quite clearly has spermatozuogmata in the spermathecae, which are absent in *T. vej dovskyi*, but present in *T. (A.) onegensis* and *T. (A.) ringulatus*. Holmquist (1974) seemed certain that the sperm are in bundles in *T. multiprostatus* and *T. pectinatus* after examining the poorly preserved slides of the senior author's dissections. The senior author is less certain as to the presence or absence of spermatozuogmata in them.

Family PHREODRILIDAE

Genus *Phreodrilus* Beddard, 1891

Phreodrilus (*Phreodriloides*?) *plumaseta* sp. nov.

Figures 23-27

Description : Dimensions unknown. Ventral setae two per bundle, bifid with upper tooth shorter and thinner than lower, those of XII missing, those of XIII paired spermathecal setae, one long and one short, hollow-ended. Dorsal setae from III single brush-tipped broad setae with paired short needles. Atria elongate, tubular vasa deferentia joining basally, apparently no penes.

Material : Collected from a depth of about 15 m from Cramps Bay and Brandum Bay in Great Lake.

Holotype, 1977/14/36 — QVM type 249.

Paratypes, 1977/14/37, 107-109 — QVM types 286-293, 351-353.

Discussion : Insufficient details are available to place this species in a subgenus, though the choice is clearly between the group *Pheodriloides* (without penes, without ampullae on spermathecal pores), and *Insulodrilus* (with ampullae, with penes), both of which have ventral genital openings. However the species is quite distinct from the members of both subgenera. Only *P. magnaseta* (below) has similar dorsal setae, but it has very distinctive ventral setae. *P. nudus* (below) has similar ventral setae but lacks the plumed hair setae, and is clearly an *Insulodrilus*. The limited amount of material available has prevented further investigation of the genital pores, the presumption at present being that they are simple, lacking ampullae or penes.

Pheodrilus (Insulodrilus) nudus sp. nov.

Figures 20-22

Description : Dorsal setae from III single, broad based and narrowing abruptly, nonserrate. Ventral setae paired, bifid, lower tooth broader than the upper, both teeth short and blunt. Spermathecal setae long, paired, with hollow tips. Genital pore in line ventro-laterally, spermathecal pores with well-developed vestibulae, penis sacs with elongate penes. Spermathecal setae enclosed in glandular sacs. Spermathecal ampullae at the end of elongate ducts. Atria long, cylindrical.

Material : Collected from the South Esk River (R. H. Norris coll.), Lake Pedder, March 1966 (W. D. Williams coll.). Five specimens examined.

Holotype, 1977/14/90 — QVM type 252.

Paratypes, 1977/14/91-93 — QVM types 335-337.

Discussion : This species is very similar to the following species, but differs primarily in the absence of serrations on the hair setae. Of the other species in the subgenus, *P. lacustris* has rudimentary vestibulae, *P. campbellianus* has no spermathecal setae, *P. litoralis* has one, and all three have dissimilar ventral setae (one simple pointed, one bifid in each pair).

Pheodrilus (Insulodrilus) magnaseta sp. nov.

Figures 28-32

Description : Dimensions unknown. Ventral setae two per bundle, simple pointed, becoming progressively larger from II to VIII, smaller from VII on, simple pointed or with reduced upper tooth. No ventral setae on XII. Spermathecal setae on XIII two per bundle, one very much longer and thinner than the other, both hollow-tipped. Dorsal setae from III, hair-like with brush tips, becoming hairy in succeeding segments, but becoming shorter and blunter behind the clitellum, one per bundle with two short lateral needles. Vasa deferentia enter long cylindrical atria basally, penes in cuticularised sacs, spermathecal pores with small vestibulae and setal sacs in line with penis sacs. Other characters as for the family.

Material : Collected from a depth of about 15 m from Swan Bay and Cramps Bay in Great Lake. Seven specimens examined.

Holotype, 1977/14/31-32 — QVM type 247-8.

Paratypes, 1977/14/25-30, 33-35 — QVM types 277-285.

Discussion : The ventral setae of this species are unique in the family, being reminiscent only of those described for *Haplotaxis gastrochaetus* (Yam.) from Japan (Yamaguchi, 1953), but in the latter the setae become larger up to the twentieth segment rather than the seventh. The dorsal setae resemble those of *P. plumaseta* (q.v.).

Phreodrilus (Insulodrilus) breviatria sp. nov.

Figures 33-36

Description: Dimensions unknown. Ventral setae clearly bifid with thin, short upper teeth. No spermathecal setae. Hair setae with needles dorsally, (3) 4-5 (6) per bundle, distinct and thick from III on, bent, tapering beyond the bend, 13-16 setae medially. Vasa deferentia join atria submedially, atria short thick cylinders, penes small in large penis sacs. Spermathecal pores close to male pores, with small vestibulae.

Material: Collected from a depth of about 15 m from Cramps Bay and Brandum Bay in Great Lake. Four mature, six immature specimens examined.

Holotype, 1977/14/45 — QVM type 250.

Paratypes, 1977/14/46-49 — QVM types 294-297.

Discussion: The atria are short and thick in this species, and consequently the near-basal position of the vasa deferentia appears to be more medial than in other species in the sub-genus. The species has bifid ventral setae in each pair, no spermathecal setae, and small vestibulae on the spermathecal pores. It does not have plumed setae nor enlarged ventrals, and so is distinguishable from the other species in the sub-genus.

Phreodrilus (Phreodrilus) branchiatus Beddard, 1891

Figures 37-38

Description: Dorsal setae from III, 1-3 long thin straight hair setae, two short needles on each side of each hair basally, often a third short hair seta. Ventral setae one thin simple pointed seta and one broad bifid seta with short, thin upper tooth in each bundle. Sixteen to fifty pairs of dorso-lateral gills posteriorly.

Material: Collected from Brandum Bay in Great Lake and from the South Esk River (R. H. Norris coll.).

Five specimens examined. 1977/14/102-106.

Discussion: The original locality for this species is in Southern Chile. It was only briefly described, but the Tasmanian material fits the description apart from a larger number of gills (from 16 in the smallest to 50 in largest specimen as opposed to 13 in the type material). Timms (1978) recorded the species from Tasmania.

Phreodrilus (Phreodrilus) palustris sp. nov.

Figures 39-43

Description: Length 10-40 mm, up to 2 mm thick. Light brown worms, in two size classes in the collection. Ventral setae 2 per bundle, both more or less blunt with a rudimentary upper tooth. Dorsal setae anteriorly thin hair-setae, progressively increasing in number and size posteriorly from 1 or 2 to 5-8 and eventually up to 19 setae a bundle, with short needles between the hairs, the setae bent, narrowing abruptly beyond the bend, dorsal setae diminish in size and number at posterior end. No modified genital setae. Vasa deferentia strongly coiled, long with thin portion proximally, thicker portion distally, joining atria at or near elaborate eversible pseudopenes. Atria moderately long, thick. Spermathecae with sperm traps in ducts, reach to 7 segments behind pores, which are dorsal with muscular vestibulae. Swims quite rapidly with a spiral motion.

Material: Collected from Swan Bay, Cramps Bay and Brandum Bay in Great Lake. Six mature specimens, three sectioned, seven immature examined.

Holotype, 1977/14/54 — QVM type 251.

Paratypes, 1977/14/51-53, 55-79 — QVM types 298-325.

Discussion: This species is, at first sight, rather similar to *P. breviatria*. In all specimens examined to date the anterior end of *P. palustris* has few, thin hair-setae and each segment has about the same diameter as the next. In *P. breviatria* the hair-setae are larger, more obvious right from III, there are more setae in III, and the anterior end is tapering because the segments increase in diameter quite abruptly. The male ducts are quite clearly different also, with true penes in *P. breviatria*, the two species therefore belonging to separate subgenera. The two ventral setae of each bundle are alike in *P. palustris*, whereas in the other species in the same subgenus they are dissimilar. Also, there are more hair-setae per bundle in this species than in others in the subgenus, especially in the median segments.

Phreodrilus proboscidea sp. nov.

Figures 44-46

Description: Prostomium with a proboscis. Dorsal setae from III, 2-4 serrate hair-setae, long, thin and straight, numerous shorter needles, usually one each side of each hair-seta. Ventral setae of III and IV simple pointed, one thicker than the other, from V on one bifid with short thin upper tooth, one thinner simple pointed.

Material: Collected from Cramps Bay in Great Lake and also from Lake Pedder, March 1966 (W. D. Williams). Ten whole mounts.

Holotype, 1977/14/80 — QVM type 253.

Paratypes, 1977/14/81-89 — QVM types 326-334.

Discussion: Some fragmentary specimens of a phreodrilid with a proboscis and serrate hair-setae were found in the Lake Pedder collection (Brinkhurst, 1971, p. 110) but no name had been given to the species. The above description is clearly provisional, but will suffice to distinguish this species from all others unless further research turns up two with this combination of characters. The species cannot be assigned to a subgenus pending description of the reproductive system. The definition of the family requires changing as a result of these descriptions.

Similar specimens with a proboscis and the bamboo-like serrate hair setae were sent to the senior author from a trickle beside Guthries Creek, Mt. Kosciusko, New South Wales, collected 9.1.74 by H. B. N. Hynes.

Family HAPLOTAXIDAE

Several specimens, apparently assignable to at least two species in this family, were found in Great Lake but could not be described for lack of mature specimens.

Family LUMBRICULIDAE

One immature form resembling *Lumbriculus variegatus* was observed in the South Esk River. This species has been recorded in Tasmania, and is the only cosmopolitan form in the holarctic family.

DISCUSSION

According to earlier records (Brinkhurst, 1971) the only aquatic oligochaete species known from Tasmania were *Lumbriculus variegatus*, *Antipodrilus davidis* and two new species of *Telmatodrilus* from Lake Pedder (*T. multiprostatatus* and *T. pectinatus*). A preliminary inspection of a collection on loan from B. V. Timms established the presence of one of these (*T. multiprostatatus*) in two Tasmanian lakes, together with the cosmopolitan *Limnodrilus hoffmeisteri* in a third. This collection was subsequently investigated in more detail by Dr. K. V. Naidu who found *Tubilex tubilex*, *Limnodrilus udekemianus*, both the new *Telmatodrilus* species and *Phreodrilus branchiatus* together with some unnamed species (Timms, 1978).

The present collection contains ten new species plus *P. branchiatus* and *Limnodrilus hoffmeisteri*. The absence of other known Australian species and the presence of so many new species further emphasises the unique nature of the Tasmanian aquatic oligochaete fauna. Of the known Tasmanian species *P. branchiatus* is known only from Chile, *L. hoffmeisteri*, *L. udekemianus* and *L. variegatus* are cosmopolitan, *T. pectinatus* is known from the Australian mainland and *A. davidis* from the Australian mainland and New Zealand, leaving eleven species which may be endemic to the island.

Likewise a difference between Tasmanian and Australian mainland faunas has been noted in the stonefly group. Hynes (1976) found that only six out of a total of sixty-six stonefly species can be found on both sides of Bass Strait according to the most conservative count. However, the genera are often shared, both in the oligochaetes and stoneflies.

The generic limits in the oligochaeta may yet be revised, especially in the monotypic "Gondwanaland" family Phreodrilidae.

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FIGURES 1-12

Figures 1-5

Antipodrilus plectilus sp. nov.

1. Setae of II.
2. Setae of VII.
3. Spermathecal seta in sac with glands.
4. Two spermatozuogmata.
5. Atria, prostates, vasa deferentia and ejaculatory ducts.

Figures 6-8

Antipodrilus multiseta sp. nov.

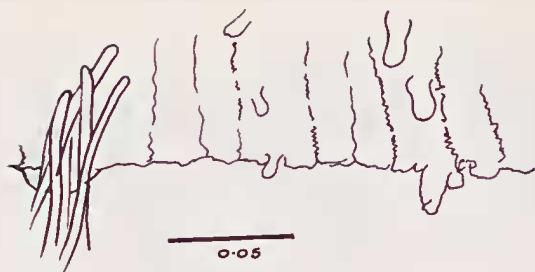
6. Spermathecal setae.
7. Spermatheca and spermathecal seta.
8. Male efferent duct — sperm funnel at top, penis on lower right.

Figures 9-12

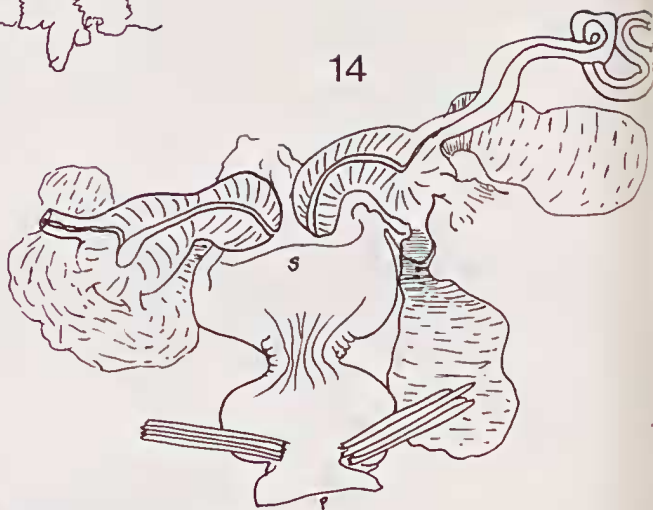
Telmatodrilus papillatus sp. nov.

9. Ventral setae of IV.
10. Setae of VIII.
11. Setae of XI-XIII.
12. Posterior seta.

13



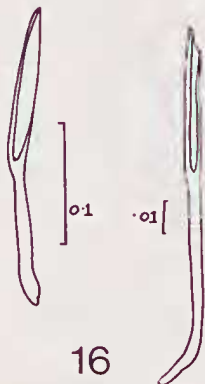
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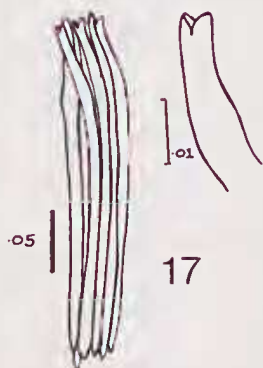
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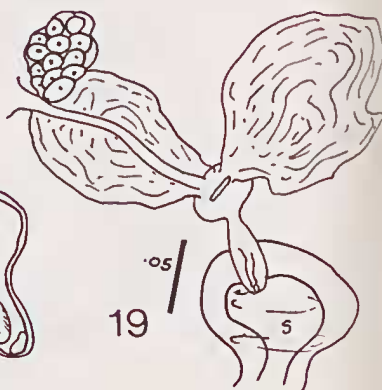
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18



19



FIGURES 13-19

Figures 13-14 *Telmatodrilus papillatus* sp. nov. (cont.)

13. Body wall showing papillae.

14. Male efferent ducts — two atria with prostates (attachment not certain) entering common median sac(s) to median pore (p) with penial setae.

Figures 15-19 *Telmatodrilus bifidus* sp. nov.

15. Setae, anterior and median.

16. Spermathecal setae (note two sizes).

17. Penial setae.

18. Spermatheca with spermatozeugmata.

19. Vas deferens, ovary, prostate (attachment uncertain), atrium and median sac(s).



FIGURES 20-31

Figures 20-22

Phreodrilus nudus sp. nov.

20. Ventral setae of III, VII.

21. Dorsal seta.

22. Reproductive system: spermathecal ampulla (sp) with long duct, vestibulae anterior to spermathecal seta; penis (p) and coiled atrium.

Figures 23-27

Phreodrilus plumaseta sp. nov.

23. Anterior ventral setae.

24. Anterior dorsal seta.

25. Median dorsal seta.

26. Spermathecal seta.

27. Male duct.

Figures 28-31

Phreodrilus magnaseta sp. nov.

28. Anterior end showing progressive enlargement of ventral setae.

29. Ventral setae of II, V, VI (from left to right).

30. Spermathecal setae in sac, detail of tip.

31. Dorsal seta of II, VIII, XV (from left to right).



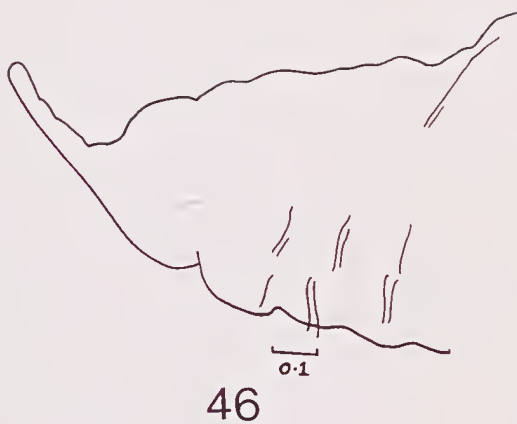
FIGURES 32-43

Figure 32 *Phreodrilus magnaseta* sp. nov. (cont.)
32. Male efferent duct.

Figures 33-36 *Phreodrilus breviatria* sp. nov.
33. Ventral seta.
34. Dorsal setae.
35. Prostomium and conical anterior end.
36. Male efferent ducts and spermathecae.

Figures 37-38 *Phreodrilus branchiatus*
37. Ventral setae.
38. Posterior end with gills.

Figures 39-43 *Phreodrilus palustris* sp. nov.
39. Ventral setae.
40. Anterior end — not tapering, conical (c.f. 35).
41. Male efferent duct: male pore (p), sperm funnel (s), and atrium (a).
42. Spermathecal pore (p), sperm trap, spermathecal duct leading to ampulla.
43. Dorsal setae.



FIGURES 44-46

Figures 44-46

Phreodrilus proboscidea sp. nov.

44. Ventral setae of II.

45. Ventral setae of V.

46. Anterior end with proboscis.